EQUINE VETERINARY JOURNAL

Equine Veterinary Journal ISSN 0425-1644
DOI: 10.1111/j.2042-3306.2012.00557.x

Short Communication

Modified parainguinal approach for cystic calculus removal in five equids

A. E. WATTS* and S. L. FUBINI

Clinical Sciences, Cornell University, New York, USA.

*Correspondence email: awatts@cvm.tamu.edu; Received: 05.10.11; Accepted: 31.01.12

Summary

This report describes a modification of the parainguinal approach for removal of cystic calculi: a ventral midline laparotomy-guided parainguinal laparocystotomy. The ventral midline approach to the abdomen is rapid and routinely used by equine surgeons. With an arm introduced to the abdomen via the ventral midline, the surgeon is able to select the ideal parainguinal laparotomy incision location that allows bladder exteriorisation with the minimum amount of tension. Because the surgeon's hand is introduced via the ventral midline incision, the parainguinal incision can be sized to just allow exteriorisation of the urinary bladder and urolith, increasing extra-abdominal bladder security during cystotomy while reducing incision size in the parainguinal region. Finally, an assistant's hand via the ventral midline incision can maintain bladder stability within the parainguinal incision during cystotomy closure.

Keywords: horse; cystotomy; bladder; calculus; veterinary; parainguinal

Introduction

Urolithiasis accounts for 8% of diagnoses related to the urinary tract of horses and is most common in geldings [1–3]. Various surgical approaches under local or general anaesthesia have been described for the removal of urinary bladder calculi in geldings, including caudal ventral midline [4], caudal paramedian [1,5,6], parainguinal [7], standing pararectal [8], standing perineal urethrotomy [1,2,9,10] and laparoscopic approaches [11]. The numerous reported approaches may reflect the inherent difficulty of cystotomy in the mature male horse in addition to the relative infrequency of these cases.

Our purpose is to describe another option for removal of cystic calculi: a ventral midline laparotomy-guided, parainguinal cystotomy that allows for ideal parainguinal laparotomy incision location selection, minimising parainguinal incision size and need for manual bladder fatigue, without the need for laparoscopic equipment. This approach has been used in 5 equids in our hospital and the results will be described briefly.

Materials and methods

Animals

Cases in which the reported technique was utilised include a 19-year-old donkey gelding (*Case 1*), a 16-year-old Quarter Horse gelding (*Case 2*), a 15-year-old Quarter Horse gelding (*Case 3*), a 20-year-old Standardbred stallion (*Case 4*) and a 5-year-old Thoroughbred gelding (*Case 5*). Each animal was presented for urinary cystic calculi removal. Preoperative work-up included complete blood count (CBC), serum chemistry, urinalysis, urine culture and sensitivity and rectal examination, with the addition of rectal ultrasonography and cystoscopy in *Cases 1, 2* and *4*. Animals were held off feed for 10 h prior to anaesthesia and were administered potassium penicillin (22,000 u/kg bwt i.v.), gentamicin (6.6 mg/kg bwt i.v.) and flunixin meglumine (1.1 mg/kg bwt i.v.) preoperatively. *Case 4* also received 60 mg morphine and 6 mg detomidine, epidurally, prior to anaesthestic induction.

Surgical technique

Animals were anaesthetised and positioned in dorsal recumbency, with the penis catheterised and secured away from the operative field. The ventral abdomen was prepared for aseptic surgery allowing surgical access to the ventral midline cranial to the prepuce and to the parainguinal regions.

A 12 cm ventral midline incision was made at the level of the umbilicus (*Case 2, 3, 4* and *5*) or in the parainguinal region (*Case 1*) and a hand was placed in the abdomen, directed caudally and the urinary bladder was identified (Fig 1a). Through manual manipulation of the urinary bladder, a parainguinal location for a second laparotomy incision was selected to allow bladder exteriorisation with minimal tension (Fig 1b). The length of the parainguinal laparotomy incision was made to match the estimated diameter (by palpation via the midline laparotomy) of the urolith (5, 5.5, 12, 20 and 6 cm respectively).

At completion of the parainguinal incision, the urinary bladder was re-grasped by a hand via the ventral midline incision and directed to the parainguinal incision for bladder exteriorisation. The bladder was maintained in the exteriorised position by the tight fit of the urolith within the parainguinal body wall incision and the lack of significant traction on the bladder. Additionally, the assistant's hand could remain within the abdomen, pushing up on the exteriorised bladder, throughout the cystotomy and bladder closure. This was important after urolith removal, especially for the larger uroliths in *Cases 3* and *4*. Sterile laparotomy sponges were placed around the exteriorised bladder, within the parainguinal incision. Stay sutures of 0 polyglactin 910 were placed at the lateral apices of the bladder to aid in cystotomy closure and an appropriate cystotomy was made for urolith removal followed by copious luminal lavage with sterile 0.9% saline. Cystotomy closure was performed with 2-0 polyglactin 910 in a 2-layer closure consisting of simple continuous appositional pattern followed by continuous inverting Cushing's pattern. The serosal surface was cleaned of blood clots, the stay sutures removed and the bladder returned to the abdomen. If at any point during cystotomy the bladder retracted to the abdomen, the assistant manually elevated the bladder within the parainguinal incision with their arm introduced via the ventral midline incision.

Both body wall incisions were lavaged with sterile 0.9% saline and closed routinely.

Post operative care

Cases were maintained on flunixin meglumine (1.1 mg/kg bwt i.v. s.i.d. 1–3 days) and trimethoprim sulphamethoxazole (30 mg/kg bwt *per os* b.i.d. 7 days). Animals were discharged 3–7 days after surgery for continued stall rest with daily handwalking for 6 weeks prior to resumption of normal turnout and work.

Results

Urolith removal was successful in all animals. The surgical procedure was considered to be straightforward by the attending surgeons, no complications were encountered during surgery and there was minimal to

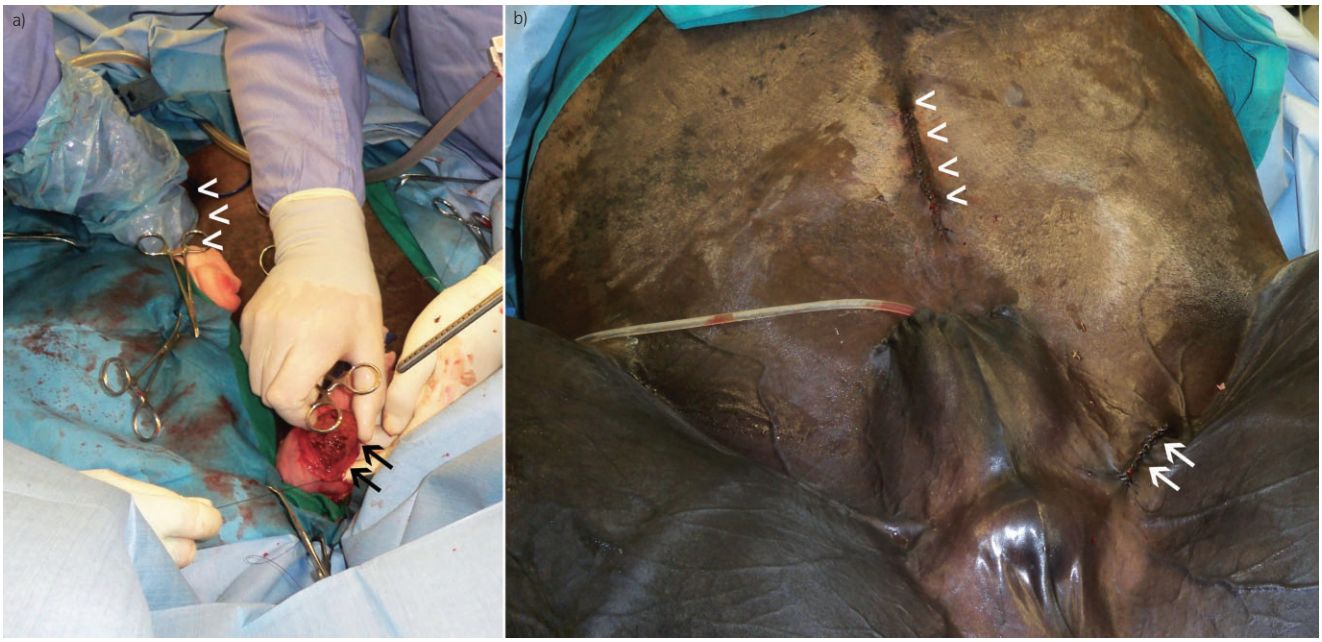

Fig 1: a) Photograph of the modified parainguinal approach for urolith removal in *Case 5*. The ventral midline laparotomy (^) improves incision site selection for the left parainguinal incision (↑) and allows the assistant to elevate the urinary bladder to the left parainguinal incision during cystotomy for urolith removal. b) Photograph of modified parainguinal approach immediately post operatively to demonstrate incision location and size. Because the surgeon's arm is introduced via the ventral midline incision (^), the left parainguinal incision (↑) is just large enough for bladder and urolith exteriorisation.

no effort made to fatigue and exteriorise the bladder compared with our experience with other open approaches to the bladder under general anaesthesia. Post operatively, mild peri-incisional oedema associated with the parainguinal incision was noted in all cases and oedema was noted surrounding the ventral midline incision in *Cases 1, 3* and *4. Case 5* dripped urine from a partially exteriorised, but retractable, penis for 48 h, but did not require any additional treatment. *Cases 3* and *4* developed a fever (39.1°C and 39.2°C, respectively) without abnormalities in their CBC during the second post operative day, both of which resolved without any change in treatment by 72 h.

Follow-up 6 months to 5 years later indicated that 3 of the animals were doing well, and no owner reported incisional complications or recurrence of the condition. *Case 4* had been febrile, 2 weeks after surgery, due to continued bacterial cystitis. This was successfully treated by the attending veterinarian with another 10 days of trimethoprim sulphamethoxazole and no additional complications occurred. The owner of one case was not reachable by phone; however, the attending veterinarian was not aware of any problems following surgery.

Discussion

Because of the difficulty, duration and complication rate of standing procedures, most surgeons prefer cystic urolith removal in geldings under general anaesthesia [2,4,8,12–16]. Laparotomy approaches can result in difficult dissection and ligation of external pudendal and caudal superficial epigastric vessels [7], and limited exposure of the bladder, necessitating tedious and time consuming manual bladder fatigue for complete exteriorisation and improved bladder closure [1,4]. Alternatively, laparoscopic approaches minimise the size of the parainguinal or paramedian body wall incision, improve bladder visualisation and abolish the need for tensioned bladder manipulation and closure [11,17]. Unfortunately, the laparoscopic approach is technically demanding, requires intracorporeal suturing skills and can result in (potentially septic) urine contamination to the abdominal cavity. Subsequently, a laparoscopic-assisted parainguinal laparotomy approach has been described to gain the benefits of both a laparoscopic approach and an open abdomen approach. This combination of techniques utilises the laparoscopic benefits of improved visualisation leading to ideal localisation of the parainguinal laparotomy incision and the optimal parainguinal laparotomy incision size for bladder exteriorisation. With this technique, and the approach we report, the improved parainguinal incision location minimises the need for tedious and time consuming bladder fatigue to deliver the bladder to the incision, while the open parainguinal laparotomy incision improves ease of bladder closure and reduces abdominal urinary contamination compared with strictly laparoscopic techniques [18].

Our modified parainguinal approach shares the 2 main advantages of the laparoscopic-assisted parainguinal laparotomy approach without the need for specialised laparoscopic equipment. The first is improved parainguinal incision site selection, thereby minimising the need for lengthy bladder fatigue and minimising the risk for accidental retraction of the bladder into the abdomen prior to cystotomy closure. The second is limiting the size of the parainguinal incision to that large enough for the bladder and urolith only, rather than it having to be large enough for the surgeon's hand, the bladder and urolith [18].

Case 1, the first in which we used this '2-hole' open approach, was not included in our preoperative planning. A routine parainguinal approach [7] was made, but due to the obesity (body condition score 8/9), small size of the patient (240 kg), or differences in anatomy of the donkey including a narrow pelvic canal and/or narrow inguinal space, the incision was made excessively craniad, and the bladder could not be delivered to the incision. Rather than extend the incision caudad, a second, more caudal parainguinal incision was made after a hand through the first incision was used to identify a location where the bladder could easily be manipulated. Through the first parainguinal incision, the bladder was easily delivered to the second parainguinal incision under minimal tension and cystotomy closure was essentially tension free. Because bladder delivery to a parainguinal incision and bladder security during closure was so much easier when a hand was in the abdomen via a separate incision, the ventral midline laparotomy-guided paramedian laparocystotomy approach we describe here was elected, *a priori*, for the following 4 cases. By using one hand to elevate the urinary bladder from within the abdomen, the parainguinal laparotomy could be made directly over the urinary bladder and calculus without the need for continued traction. The reduced bladder tension and more precise selection of incision location prevented the urinary bladder from retracting back to the abdomen; especially after the

calculus had been removed and during bladder lavage and cystotomy closure. If retraction of the bladder occurred prior to cystotomy closure, the assistant's hand, via the ventral midline incision, could be used to stabilise the bladder within the parainguinal incision.

In summary, there are several techniques for the removal of cystic calculi. Our modified parainguinal approach requires general anaesthesia but no other specialised equipment. This technique allows the initial laparotomy to be made on the ventral midline, avoiding the rectus musculature and associated vascular structures, and allows optimal placement and size of the parainguinal incision. We felt this made urolith removal considerably easier and faster than other approaches and, by minimising bladder tension, there may also be reduced risk for trauma to the bladder and for potentially septic urine spillage to the abdomen. The described technique was straightforward and outcome in our 5 cases was favourable making this approach an acceptable surgical option.

Authors' declaration of interests

No conflicts of interest have been declared.

Source of funding

None.

References

1. Holt, P.E. and Pearson, H. (1984) Urolithiasis in the horse - a review of 13 cases. *Equine Vet. J.* **16**, 31-34.
2. Laverty, S., Pascoe, J.R., Ling, G.V., Lavoie, J.P. and Ruby, A.L. (1992) Urolithiasis in 68 horses. *Vet. Surg.* **21**, 56-62.
3. DeBowes, R.M., Nyrop, K.A. and Boulton, C.H. (1984) Cystic calculi in the horse. *Comp. Cont. Educ. Pract. Vet.* **6**, S268-S268.
4. Lillich, J.D., Fischer, A.T. and DeBowes, R.M. (2006) Bladder. In: *Equine Surgery*, 3rd edn., Eds: J.D. Lillich, A.T.D. Fischer, and R.M. DeBowes, Saunders Elsevier, St Louis. pp 343-350.
5. Bruck, I. and Hesselholt, M. (1992) Nephrolithiasis as a cause of colic in horses [case report]. *Tierarztl. Prax.* **20**, 611-614.
6. Mair, T.S. and McCaig, J. (1983) Cystic calculus in a horse. *Equine Vet. J.* **15**, 173-174.
7. Beard, W. (2004) Parainguinal laparocystotomy for urolith removal in geldings. *Vet. Surg.* **33**, 386-390.
8. Abuja, G.A., Garcia-Lopez, J.M., Doran, R. and Kirker-Head, C.A. (2010) Pararectal cystotomy for urolith removal in nine horses. *Vet. Surg.* **39**, 654-659.
9. Textor, J.A., Slone, D.E. and Clark, C.K. (2005) Cystolithiasis secondary to intravesical foreign body in a horse. *Vet. Rec.* **156**, 24-26.
10. Hanson, R.R. and Poland, H.M. (1995) Perineal urethrotomy for removal of cystic calculi in a gelding. *J. Am. Vet. Med. Ass.* **207**, 418-419.
11. Ragle, C.A. (2000) Dorsally recumbent urinary endoscopic surgery. *Vet. Clin. N. Am.: Equine Pract.* **16**, 343-350.
12. Eustace, R.A., Hunt, J.M. and Brearley, M.J. (1988) Electrohydraulic lithotripsy for the treatment of cystic calculus in two geldings. *Equine Vet. J.* **20**, 221-223.
13. Koenig, J., Hurtig, M., Pearce, S., Henderson, J. and Morris, T. (1999) Ballistic shock wave lithotripsy in an 18-year-old Thoroughbred gelding. *Can. Vet. J.* **40**, 185-186.
14. Howard, R.D., Pleasant, R.S. and May, K.A. (1998) Pulsed dye laser lithotripsy for treatment of urolithiasis in two geldings. *J. Am. Vet. Med. Ass.* **212**, 1600-1603.
15. Judy, C.E. and Galuppo, L.D. (2002) Endoscopic-assisted disruption of urinary calculi using a holmium:YAG laser in standing horses. *Vet. Surg.* **31**, 245-250.
16. VanDongen, P. and Plenderleigth, R. (1994) Equine urolithiasis: surgical treatment by Gokels pararectal cystotomy. *Equine Vet. Educ.* **6**, 186-188.
17. Ragle, C.A. (2002) Laparoscopic removal of cystic calculi. In: *Equine Diagnostic Surgical Laparoscopy*, Ed: A.T. Fischer, W.B. Saunders, Philadelphia. pp 229-234.
18. Rocken, M., Stehle, C., Mosel, G., Rass, J. and Litzke, L.F. (2006) Laparoscopic-assisted cystotomy for urolith removal in geldings. *Vet. Surg.* **35**, 394-397.